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Notes on the Pine-inhabiting Species of Peridermium. [*]

BY LUCIEN M. UNDERWOOD AND F. S. EARLE.

There seems to have been much confusion regarding the pine-inhabiting species of *Peridermium* not only in this country but also in Europe, and the difficulties in the way of a clear understanding of the species have not been entirely removed. So far as we have been able to discover we have only three species of this group in the eastern United States besides three nominal species from western North America which we have not been able to examine.[†] It is possible that the examination of the type of another Eastern species (now inaccessible for the time) may reveal some features that its description does not show and require further modification of the synonymy.

Two of our species are foliicolous and produce only a minimum of disturbance in the tissues of their host, while the third is found only on stems producing extensive gall-like swellings often of enormous size. These may appear on the smaller limbs, or on branches of various sizes, or on the main trunk of trees of considerable diameter. So far as the economic relations are concerned, the foliicolous species rarely produce any considerable damage, but the stem-inhabiting species causes extensive damage in some portions of the South in the deterioration or death of chiefly young pines. The Eastern species are as follows:

1. PERIDERMIUM ACICOLUM (Wallr.).

P. pini var. *acicolum* Wallr. Fl. Crypt. 262. 1833.

P. oblongisporium Fuck. Symb. Mycol. 42. 1869.

This species, which is very distinct from the stem-inhabiting *Peridermium pini* of Europe, appears to be confined to the Northeastern states and is not separable from the forms occurring in Europe on various hosts. With us it has been found only on *Pinus rigida*. We have seen specimens from Massachusetts (Underwood, Seymour) and New Jersey (Pennypacker) only. The spores are large, usually oval, often reaching 40 μ; the peridial cells form a thin tenacious membrane and do not readily separate from one another when placed in dilute potash; their ends are usually rounded, but are sometimes obliquely truncate, imbricate or occasionally in rows placed end to end; they are somewhat intermediate in this respect between our other two species.

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[*] Read before Section G, A. A. A. S., Buffalo meeting, August, 1896.

[†] *P. Englemanni* Thuem., from Colorado; *P. filamentosum* Peck, from Arizona and *P. Harknessii* Moore, from California.

EXSICC. Ellis & Everhart. N. A. Fungi, 2222; Seymour & Earle, Economic Fungi, 223.

The above species has been confused with *P. pini*. Wallroth was the first to distinguish it as a foliicolous variety, while Fuckel made it a distinct species. Unless we are to recognize only one pine-inhabiting *Peridermium* which is clearly illogical, we must maintain this as a distinct species. If we are to follow in the lead of some of the highly imaginative fungiculturists, some of whom maintain that this form is the aecidial stage of a *Cronartium*, while *P. pini* is similarly regarded as the corresponding stage of a *Coleosporium*, the two must be at least specifically distinct, since in their mature stage they would belong to two totally different genera! Winter singularly unites them in one species without even maintaining a varietal distinction.

2. PERIDERMIUM ORIENTALE Cooke, Indian Forester, 3: 91.

With some hesitation we refer the large leaf-inhabiting species of the Southern States to this name, originally described from northern India. In this we are supported by three somewhat questionable principles: (1) A writer is supposed to know his own species (a principle, however, which does not always follow) and the specimens issued in Ravenel's Fungi Amer., cited below, were doubtless examined by Cooke, who was the author of the species in question; (2) There is little in the description of the species as quoted in Saccardo that would stand in the way of such a reference; and (3) The species has commonly been referred to this name by American authors. While, therefore, it seems hardly probable that there should be a species of *Peridermium* common to two such remote localities as India and the southern United States, and while the original specimen may, in the light of characters now recognized that are not touched upon in the original description, prove totally distinct, it seems hardly wise to us to establish a new species without first seeing the type of the one to which it has been referred. On this principle of *laissez faire* we retain with some mental reservations the above name.

This species seems to have a wider range of host plants as well as a greater geographic distribution than the preceding. We have examined specimens as follows:

On *Pinus taeda.* Georgia (Ravenel, Underwood); Alabama (Underwood & Earle).

On *Pinus palustris.* South Carolina (Ravenel); Florida (Martin, Underwood); Alabama (Earle & Underwood); Mississippi (Earle & Tracy).

On *Pinus* sp. Missouri (J. G. Barlow).

This handsome species is quite abundant in the Southern States, and while found more commonly on comparatively young trees it frequently appears on trees of considerable size. It was first distributed by Ravenel as *Aecidium pini* of which he curiously gives *Peridermium pineum* Schw. as a synonym, notwithstanding Schweinitz alludes distinctly to the peculiar gall-like growths that are discussed under the following species. Later Ravenel distributed the same thing under the name of *P. orientalis* [*sic*] Cooke.

The spores are small, rotund or broadly oval, and like the peridial cells, thickly beset with long weak obtuse spines; in size they are variable, averaging 20 μ. The peridial cells approach rectangular, are truncate and placed end to end, are variable in size, averaging about 40 by 25 μ, and readily separate from one another; they are thickly beset with long, obtuse echinulations, which, when seen from above, give the appearance on a casual examination of being radiate-striate on the margin.*

Exsicc. Ravenel. Fungi Carol. fasc. 1, no. 93 (as *Aecidium pini*).

Ravenel. Fungi Amer. 270.

Ellis. N. A. Fungi, 1026.

Seymour & Earle. Economic Fungi, 224 (as *Peridermium pini* var. *acicolum*).

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* This character is common to all the species of *Peridermium* we have examined, though it seems to have been overlooked, since the peridial cells are usually described as wrinkled or striate margined. The echinulations are unusually long and conspicuous in this species.

3. PERIDERMIUM CEREBRUM Peck, Reg. Rep. 25: 91. 1873.

Peridermium pineum Schw. Trans. Amer. Phil. Soc. 4: 294. 1835. Not Lk.

? *Peridermium pyriforme* Peck, Bull. Torr. Bot. Club, 6: 13. 1875.

This stem-inhabiting species was first mentioned by Schweinitz in Syn. Fung. Carol. *No. 456* and afterward in Syn. Fung. Bor. Am., where he describes it as follows: "In Pennsylvania prope Philadelphia et alibi non rarum. Specimina ampla, pedalia in ipso trunco Pini inopis mihi obvia, analogon praebuerunt Gymnosporangis juniperini." Later the species was collected by Lintner at Center, New York, on *Pinus rigida* and described by Peck as *Peridermium cerebrum*. Professor Peck informs us that the species is not common in eastern New York. We have seen the type specimen, which is not different from the forms common about Washington on *Pinus Virginiana* and farther south on *P. echinata*, except that the gall is larger in proportion to the size of the stem.

Peck described later a second species sent him by Ellis either from New Jersey or Georgia. Of this we have not been able to see the type, but its striking characteristic of pyriform spores mentioned in the description we have found in both forms of *P. cerebrum* as they occur in the South. A form distributed by Ellis, N. A. Fungi, 1021, "On seedlings of *Pinus inops* Ait," shows microscopic characters similar to this species, but in the set examined the fungus appears to make only a slight swelling and that totally unlike the normal one produced on *P. Virginiana*. There may have been some error in the determination of the host. This matter has been left for later consideration.

Specimens have been examined as follows:

On *Pinus rigida*, New York (Peck); New Jersey (Ellis); Massachusetts. (Underwood); the last named specimen was in the form of a convex swelling at the base of a large tree; the others are of the typical globose form.

On *Pinus Virginiana*. Virginia (Galloway); Alabama (Underwood); to these should be added the Schweinitzian reference to Pennsylvania above cited; all these forms are of the globose type.

On *Pinus echinata*. Alabama (Earle & Underwood). These are also of the globose type.

On *Pinus taeda*. Alabama (Underwood & Earle); Mississippi (Tracy). These are of the fusiform type described below.

On *Pinus sp*. Webster County, Mississippi (W. B. Stark). Also of the fusiform type, though represented only by fragments.

In microscopic characters this species is related to the European *Peridermium pini* (P.) Wallr., but sufficiently distinct. The spores are of medium size, 20–30 μ long, irregularly oval, ovate or pyriform; the peridial cells are long and narrow, with pointed ends, arranged imbricately and never end to end; they are about 40–60 μ by 15–20 μ and do not readily separate from one another in dilute potash.

Exsicc. Ellis, N. A. Fungi. 1022.

We have observed the development of the globose type on *Pinus echinata* in central Alabama, where it is very common and causes considerable damage among the pines. It frequently appears as globose swellings less than two centimeters in diameter, on small twigs, and often during its early stages of growth no spores are developed. The mycelium is perennial and later produces conspicuous yellow peridia, which are often arranged so as to form convolutions giving a resemblance to the surface of the brain. Within these, spores are produced in prodigious quantities. Unless the branch is killed, the parasite continues to grow for a succession of seasons, producing more spores each season. Usually the gall entirely surrounds the branch, but in some cases the branch escapes with only one side affected. Occasionally the main trunk will be first affected and, continuing to grow with its gall, will form a large ball a foot or more in diameter. Since the plant is perennial the necessity of an alternate host is not immediate, and it will be a matter of future investigation as to what becomes of the spores. Some source of infection must be at hand, since the parasite is very abundant in the South, some considerable areas in eastern Alabama showing nearly every tree of the species more or less affected.

On *Pinus taeda* the form of the gall is entirely different. Instead of a globose type, which occurs on the other hosts, we have an elongate fusiform enlargement of the branch almost uniform in every direction, so as to produce an almost perfect spindle. So far as we can discover, there are no microscopic differences between this form and the globose type, either in the spores or peridial cells, both showing the same characters and the same variations. The difference in the gall, however, is so marked and so constant, and the parasite on both pines is so common, that the shape of the gall often serves as a ready means of identifying the trees at a glance. Occasionally larger trunks will be affected, and then the gall retains its typical elongate character instead of the rounded convex forms that appear on *Pinus echinata* in the South, and that we have seen on *Pinus rigida* as far north as Massachsetts. The occurrence of such marked macroscopic characters opens up an interesting question as to how much weight should attach to what may be called "habit characters." Shall they be disregarded, shall they be recognized as varietal differences, or shall they serve as specific characters of equal weight with those which require a microscope to detect? We have provisionally adopted the first course in the present case.

AUBURN, ALABAMA, July, 1896.

Studies in the Botany of the southeastern United States—VII.

By JOHN K. SMALL.

RUMEX LANGLOISII n. sp.

Perennial, glabrous, somewhat scurfy, dark green (when dry). Stem erect or ascending, 5–7 dm. tall, simple or with a few nearly erect branches, more or less flexuous, at length strongly furrowed; leaves oblong or linear-oblong, 3–12 cm. long, acuminate or acutish, erose crenulate, slightly crisped, somewhat prominently nerved especially beneath, narrowed into a petiole which is usually 1 or 2 cm. long; ocreae very thin, early falling away; panicle rather open, not leafy, 1–2 dm. long; racemes strongly ascending, 5–10 cm. long, usually interrupted; flowers about 2 mm. long, in dense whorls (in fruit); pedicels about 5 mm. long, articulated near the base, enlarged towards the end; wings rather coriaceous, deltoid, 4 mm. long, the sides rounded, the apex blunt, the surface prominently nerved, each bearing a papillose calosity 1 mm. broad and 3 mm. long; achene ovoid, nearly 3 mm. long, abruptly contracted into a very short base, slightly acuminate at the apex, the faces dark red, the angles slightly paler and margined.